Для вітроустановки невеликої потужності з номінальною частотою обертання ротора 100 об/хв доцільно застосовувати магнітний підвищуючий редуктор, характеристиками якого є: безшумність роботи, відсутність мастила, довговічність роботи без обслуговування.

Застосування магнітного редуктора дозволяє зменшити масу і габарити електрогенератора в порівнянні з випадком безпосереднього приєднання генератора до валу вітроротора.

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MODERNIZATION AND RATIONALE OF PARAMETERS OF TRANSFORMER SUBSTATION “ZHULYANY”

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Abstract. *This paper deals with the modernization of transformer substations and their equipment. The types of high-voltage switches are analyzed, the possibilities of improvement are revealed and the changes to the design of the air switch are proposed, which will allow to increase its speed and reliability of operation.*

Keywords: *transformer substation, air-blast switch, switchgear, electrical equipment, modernization.*

Анотація. *В даній роботі розглядається питання модернізації трансформаторних підстанцій та їх обладнання. Проаналізовані види високовольтних вимикачів, виявлені*

можливості удосконалення та запропоновано зміни до конструкції повітряного вимикача, які дозволять підвищити його швидкодію та надійність роботи.

Ключові слова: *трансформаторна підстанція, повітряний вимикач, розподільний пристрій, електрообладнання, модернізація.*

Introduction. The problem of the energy sector of Ukraine is the poor technical condition of power plants, substations and networks, namely: the large deterioration of the equipment of power plants and substations, which have been in operation for more than 45 years and worked out a normative resource. One of the ways of solving the problems in the energy sector of Ukraine is the technical re-equipment of power stations, substations and networks, which implies the maximum dismantling of the equipment that has produced its resource and its replacement with a new one.

The purpose of the work. The purpose of the work is to develop proposals for the modernization of the "Zhulyany" transformer substation. To achieve this goal, the tasks of assessing the technical condition of the equipment, analyzing the existing electrical equipment of the substations and formulating proposals for the replacement and improvement of the structure, taking into account the existing requirements and prospects for increasing the transmitted power are solved.

Materials and methods. This paper provides a comparative analysis of existing types of high-voltage switches and computer simulation of switchgears elements.

Results. Within the framework of the modernization program, replacement of worn out and outdated equipment is proposed in accordance with current requirements and needs [1, 2]. The replacement of four double-winding transformers on double-winding transformer with split winding and more power (type ТРДН-40000/110) was proposed. In these types of modern transformers silicone and sealed inputs and outputs (GSA-123-OA/1600/0,5), gas relay (РГТ-80-201), control relay for the step switch (URF-25/10), built-in transformers currents are intended for protection of the transformer (ТТВ-110). Higher power transformers are being selected because, at the end of the economic crisis, production at enterprises will increase and load will increase.

Disconnectors РНДЗ-110 need to be replaced with new ones, because splinters, cracks, scratches on porcelain and reinforcement, working knives and sponges, gear drives (when switching), collapse and rust.

Reactors are being replaced by РТСТ-10-1000-0,18У3 type reactors. Modern reactors are produced in Ukraine. They are smaller in size, made of metal and with a copper winding, which allows to reduce the resistance, that is, it is better not to pass shock currents to the buses of 10 kV substation. The installation takes place vertically, but each phase is connected opposite to the other phase.

The object of modernization was chosen precisely the air switch [3], as the principle of double breaking will allow to increase the speed of the given switch and also to prolong its service life and safety. In particular, it will allow to consider the application of this type of switches to higher voltage (more than 300 kV).

To solve the problem, we propose the introduction of a double break method. That is, in the contact system of circuit breakers is introduced in addition to an additional pair of contacts, replacing them with bridged ones. Also, these two pairs of contacts are interconnected, which will allow them to work simultaneously. The implementation of this principle will accelerate the operation of switches, making their shutdowns almost instantaneous. Also, the operation of two pairs of connected contacts will reduce their oxidation and mechanical deformation over time, which occurs from frequent switching.

Conclusions. In order to ensure the prospective development of enterprises that are powered by the "Zhulyany" substation, it is advisable to overhaul the installed capacity of the transformers during major repairs. Is urgent upgrading substation equipment by adjusting the voltage of 10 kV for lowering spare electricity losses in the power supply system.

Installation of the air-blast switch increases the reliability of the substation when distributing load currents among other substations and consumers of 10 kV and allows to increase the life of the

substation. Using a "double break" switch in the design will increase the contact life, which in turn increases the number of possible switches.

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ENERGY PRINCIPLE FOR EVALUATION OF ACCESSIBILITY OF APPLICATION OF A REGULATED ELECTRIC DRIVE FOR TURBOINSTALLATIONS

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Annotation. *An energy principle is proposed for evaluating of the feasibility for using of a controlled electric drive for turbine plants, in contrast to the cost analysis method. A distinctive feature of the proposed methodology is the use of specific energy consumption as a criterion in comparison with the "net energy" for a similar technological process.*

Key words: *reduced specific energy consumption, net energy, efficiency, energy principle, adjustable electric drive, turbine unit, pump unit.*

Анотація. *Запропоновано енергетичний принцип оцінки доцільності застосування регульованого електроприводу для турбоустановок на відміну від вартісного методу аналізу. Відмінною особливістю запропонованої методики є використання в якості критерію наведених питомих енерговитрат в порівнянні з «енергією-нетто» на аналогічний технологічний процес.*

Ключові слова: *наведені питомі енерговитрати, енергія-нетто, ККД, енергетичний принцип, регульований електропривод, турбоустановка, насосна установка.*

Introduction. At first glance, the use of an adjustable electric drive to regulate the supply of the turbine installations (TBI) in accordance with their technological needs is quite attractive, since reducing the supply of TBI, for example, by half suggests a possible saving of electric power consumed by the engine by eight times. However, the cost analysis does not always take into account the costs of the frequency converter, the deterioration of energy quality in the electric power, and even more so - changes in the efficiency of the engine, the TBI mechanism and its external pipeline network.

Aim. The most generalized and objective criterion for evaluating of the effectiveness of using a controlled electric drive for TBI can be reduced specific energy costs for all successive processes of the energy conversion chain, which allows us to get away from the subjectivity of the cost analysis and take into account the actual (in connection with regulation) energy perfection of each element in terms of its efficiency and in addition indirectly taking into account a number of other factors of